ENTOMOLOGICAL NEWS

FEBRUARY 1958

Vol. LXIX **No. 2**

CONTENTS

Emerson and Elbel—A new species of Kurodaia 29

Wilson and Brown—Worker caste of parasitic M. metoecus 33

Judd—Gall flies and hymenoptera from rosette galls 39

Moure—On the genus Arhysosage Brethes from Argentina 43

Weber—Nomenclatural changes in Trachymyrmex 49

Nomenclature Notice 55

PUBLISHED MONTHLY, EXCEPT AUGUST AND SEPTEMBER, BY
THE AMERICAN ENTOMOLOGICAL SOCIETY
PRINCE AND LEMON STS., LANCASTER, PA.
AND
1900 RACE STREET, PHILADELPHIA 3, PA.

Subscription, per yearly volume of ten numbers: $5.00 domestic; $5.30 foreign; $5.15 Canada. Entered as second-class matter April 19, 1943, at the post office at Lancaster, Pa., under the Act of March 3, 1879. Acceptance for mailing at the special rate of postage provided for in paragraphs (d-2), Section 34.40, P. L. & R. of 1948, authorized April 19, 1943.

ENTOMOLOGICAL NEWS

ENTOMOLOGICAL NEWS is published monthly, excepting August and September, by The American Entomological Society at Prince and Lemon Sts., Lancaster, Pa., and the Academy of Natural Sciences, 1900 Race Street, Philadelphia 3, Pa., U. S. A.

PHILIP P. CALVERT, Editor Emeritus. R. G. SCHMIEDER, Editor. Editorial Staff: H. J. GRANT, JR., E. J. F. MARX, M. E. PHILLIPS, and J. A. G. REHN.

Subscription price, per yearly volume of 10 numbers: Domestic, $5.00; Foreign, $5.30; Canada, $5.15—U. S. Currency.

SUBSCRIPTIONS: Communications and remittances to be addressed to **Entomological News, 1900 Race Street, Philadelphia 3, Pa.**

ADVERTISEMENTS: Rate schedules available on request. Address, **Fred B. Jacobson, Advertising Manager, Entomological News, 1900 Race Street, Philadelphia 3, Pa.**

MANUSCRIPTS and all communications concerning same should be addressed to **R. G. Schmieder, Zoological Laboratory, University of Pennsylvania, Philadelphia 4, Pa.**

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ENTOMOLOGICAL NEWS

VOL. LXIX FEBRUARY, 1958 No. 2

A New Species and Subgenus of Kurodaia (Mallophaga: Amblycera)*

By K. C. EMERSON, Stillwater, Oklahoma and ROBERT E. ELBEL, Department of Zoology, University of Oklahoma, Norman, Oklahoma

The Ischnoceran genus *Falcolius* Clay, 1956, has been recorded only from the falconets or pygmy falcons of southeastern Asia. This genus apparently has no affinities with any known genera found on the remainder of the Falconiformes. The first results of a study made of several collections of amblyceran Mallophaga from this interesting group of birds are herewith reported.

The amblyceran genus *Kurodaia* Uchida, 1926, as presently defined, contains a number of species found on the Falconiformes and Strigiformes. Examination of several undescribed forms from both host orders indicates that the present generic description is adequate, except for a new form found on the host genus *Microhierax,* the falconets. In general appearance, there is some doubt that the form should be included in the genus *Kurodaia;* however a majority of the generic characters normally considered in the suborder indicate a definite relationship to this genus. Due to the significant differences between the form found on *Microhierax* and the remaining species of *Kurodaia,* a new subgenus is herewith described.

* The costs of publication of this paper were defrayed by Grant E-1722 from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health.—ED.

FALCOMENOPON new subgenus

Large stout Menoponidae distinguished from the known species of the genus *Kurodaia* by the following diagnostic characters: a comb of short setae in the lateral posterior angles of the fourth abdominal sternite, the absence of prominent setae on the median posterior margin of the abdominal tergites, the expanded lateral margins of the forehead, the large prominent male genitalia, and the presence of a row of medium-length setae on the posterior margin of the female vulva.

Type species: *Kurodaia* (*Falcomenopon*) *boonsongi* new species.

Kurodaia (Falcomenopon) boonsongi new species

Male. General shape and chaetotaxy as shown in fig. 1. Male genitalia, less the genital sac, as shown in fig. 3. The genital sac is armed with prominent teeth.

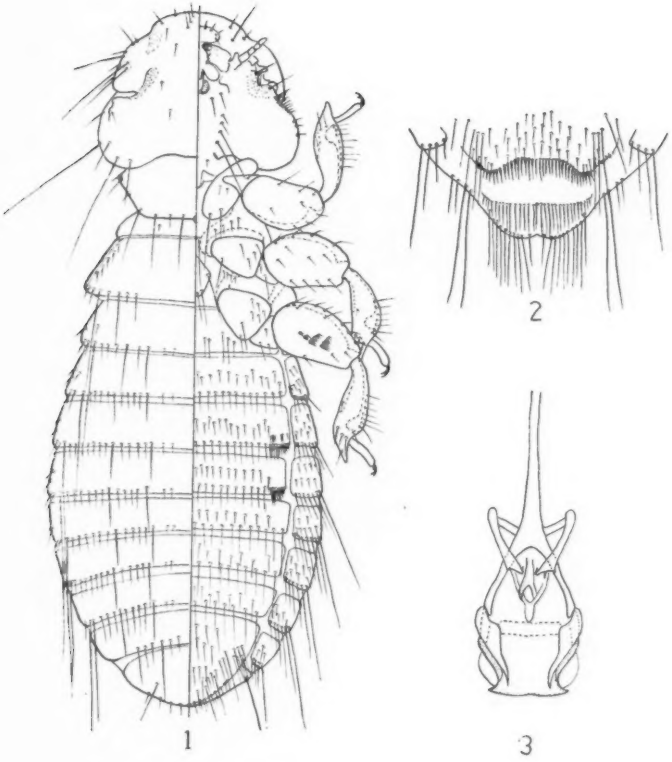
Female. General shape and chaetotaxy, except for terminal abdominal segments, similar to the male. Ventral view of terminal abdominal segment as shown in fig. 2. Dorsal chaetotaxy of terminal abdominal segments similar to that of the male.

Measurements.

	Male	*Female*
Length of head	0.39 mm.	0.40 mm.
Width of head	0.57	0.60
Width of prothorax	0.42	0.45
Width of mesothorax	0.61	0.65
Width of abdomen	0.72	0.91
Total length	1.85	2.06

Type host: *Microhierax caerulescens burmanicus* Swann.

Type material: *Holotype* male, *allotype* female and ten *paratypes* were collected at Ban Thung Chuak, Salok Bat, Kamphaeng Phet, THAILAND on June 20, 1953, by Robert E. Elbel. Four paratypes were collected at Ban Na Muang, Na Haeo, Dan Sai, Loei, Thailand on October 2, 1954, by Robert E. Elbel. Two paratypes were collected at Bo Phloi, Latya, Kanchanaburi,



Kurodaia (*Falcomenopon*) *boonsongi* new species.

FIG. 1. Dorsal-ventral view of male.
FIG. 2. Ventral view of terminal abdominal segments of female.
FIG. 3. Male genitalia.

Thailand on July 14, 1952, by Robert E. Elbel. One paratype was collected on Phu Kho Mountain, Kan Luang, Na Kae, Nakhon Phanom, Thailand on July 19, 1954, by Robert E. Elbel and Boonsong Lekagul. The holotype and allotype have been deposited in the U. S. National Museum.

In the British Museum (Natural History) are two male specimens collected off skins of *Microhierax fringillarius* (Drapiez), which may belong to this species. They have not been included in the type material because of their poor condition which precludes positive identification. If these records are correct, they indicate that the subgenus is not restricted to a single host.

This study was supported by research grant E–1722 from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health, Public Health Service. The collections were made possible by assistance from the U. S. National Museum and the U. S. Operations Mission to Thailand.

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The Worker Caste of the Parasitic Ant Monomorium metoecus Brown and Wilson, with Notes on Behavior

By E. O. Wilson and W. L. Brown, Jr., Museum of Comparative Zoology, Harvard University

In a recent issue of Entomological News we described the remarkable parasitic ant *Monomorium metoecus* from a single ergatogyne found in a nest of *M. minimum* (Buckley) at Tuscaloosa, Alabama (Brown and Wilson, 1957). On June 17, 1957, the type locality was revisited with the hope of obtaining additional material. Fortunately, the original collection site had not been disturbed, and *M. metoecus* was successfully located for the second time. A most interesting discovery made at this time was that *metoecus,* unlike the great majority of other permanent ant parasites, possesses a functional worker caste.

The new mixed colony was found at almost the identical spot, in open pine woods on the University of Alabama campus, where the type ergatogyne had been discovered seven years before. It was nesting in a deep vertical crevice in a partially buried, dead root stump at the base of a large loblolly pine (*Pinus taeda*), a situation that unfortunately rendered excavation very difficult and incomplete. The total adult population of the colony was roughly estimated at between one and two thousand; *minimum* workers outnumbered those of the parasite by about forty to one. Two dealate queens of *minimum* were recovered, but no queens or extreme ergatogynes (see below) of the parasite; the latter, if they existed, were presumed lost during excavation. Host and parasite workers were completely intermingled, with no apparent tendency toward concentration of either species anywhere inside or outside the nest. Following is a brief characterization of the newly discovered *metoecus* worker caste.

Worker: The six specimens studied (now deposited in the Museum of Comparative Zoology, United States National Mu-

seum, and personal collection of A. C. Cole, Jr.) are a rather heterogeneous lot, and it may be that it would better approximate their status caste-wise to consider them low-grade ergatogynes. They differ from the holotype ergatogyne in their narrower petiolar node, as seen from the rear (width 0.24–0.28 mm. vs. 0.35 mm. for the holotype; three workers of *M. minimum* from the host nest measured 0.12–0.14 mm.). The postpetiole is also proportionately narrower than in the holotype, and the ventrolateral conules are not so well developed; in fact, in several specimens the conules are not developed appreciably at all. The conules do not vary allometrically in this series, for some of the smallest specimens have them well developed, while the largest specimen has, to all intents and purposes, no conules at all. Although overall size (total length and bulk of whole body) is slightly to considerably less in the workers than in the ergatogyne, the head width measures about the same (workers, HW without compound eyes, 0.53–0.55 mm. vs. 0.54 mm. for the holotype). The alitrunk of the workers is shorter, both absolutely and proportionately (0.76–0.80 mm. vs. 0.88 mm.), and the convexity of the promesonotal and propodeal dorsal outlines is less marked than in the holotype. We may sum up by saying that the workers, if they are workers, show some discordance in their difference from the holotype, but in general are intermediate between the holotype and the host workers, and much closer to the former. The head width of three host nest workers measured is 0.38–0.41 mm.; alitrunk length (WL) 0.52–0.61 mm. (See text-figure.)

Prior to excavation of the nest, parasite workers were found in the files of *minimum* workers moving up and down the trunk of the pine tree during the day. Careful examination of these individuals at this time failed to reveal any peculiarities in their foraging behavior. Despite the fact that they are twice the size of the *minimum* workers, they followed the vertical odor trails on the pine trunk at about the same pace and with the same frequency of exploratory "side-tracking." Moreover, approximately the same percentage were carrying small dead insects (including psocids and aphids) gathered higher up in the

pine. Behavior in the vicinity of the nest, both before and after the disturbing effect of excavation, did not appear to differ significantly.

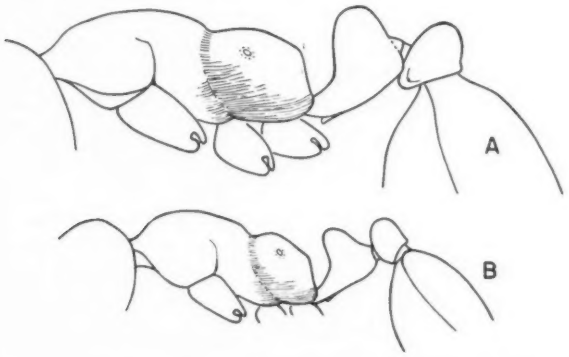

FIG. 1. A, *Monomorium metoecus* Brown and Wilson, worker alitrunk and nodes, side view. B, *Monomorium minimum* (Buckley), worker from host nest, alitrunk and nodes in side view. Both from same nest, described in text. Drawn to scale of Figure 1 in Brown and Wilson, 1957. Drawings by Nancy Buffler.

Following study in the field, most of the colony was removed and transported to Harvard University for further observation under laboratory conditions. Unfortunately, during the week-long automobile trip most of the *metoecus* workers died, only three individuals surviving to be transferred finally to an artificial nest. Once established in the nest, the *metoecus* workers continued to behave essentially like the *minimum* workers. A possible ethological difference that appeared at this time was the apparent proportionately longer periods of time spent by the three *metoecus* workers outside the nest. However, this phenomenon may have resulted in some way from the preceding heavy mortality of the parasite, e.g., the younger, nest-oriented workers may have been the first to die. Inside the nest, the *metoecus* workers were occasionally seen resting on or near the brood, but it could not be determined whether they were helping tend it. On several occasions they displayed aggressive be-

havior, in attacking alien worker ants placed near them, in defending against probing forceps tips, etc., that was apparently identical to the behavior of the host workers under similar conditions. *Metoecus* workers also fed directly on honey supplied the colony. On one occasion a parasite worker was observed exchanging food with a *minimum* worker by regurgitation, but it could not be determined whether this individual was donating or receiving. All in all, the total behavior of the parasite workers did not appear to differ in any significant way from that of the host workers within the existing limits of observation.

The question was now raised, whether the parasite worker is truly the worker caste of the previously described *M. metoecus*, as all of the morphological evidence seemed to indicate, or whether it represents instead merely another, aberrant worker caste of *M. minimum*. To test the latter hypothesis, the mixed colony, now presumed to be deprived of its parasitic reproductive form (or forms) and at first lacking brood of any sort, was maintained in the laboratory under optimum trophic conditions for a period of five months. During this time the *minimum* population more than doubled in size, but no new *metoecus* workers appeared. It was concluded that a *metoecus* reproductive form had indeed been present in the original mixed colony but had been lost during excavation and transfer to the laboratory. But of course it cannot be proved that the *metoecus* reproductive form was an ergatogyne similar to the holotype instead of a true queen or fertile worker.

The precise relationship of the parasite to its host was now considered. The large size of the *metoecus* worker suggested that the parasite might be dulotic, raiding other nests of *minimum* to increase the number of host workers. An experiment was conducted in which a small colony of *minimum* collected at Amissville, Rappahannock Co., Virginia, was placed in a common foraging arena 23 centimeters from the mixed colony. Within an hour both *minimum* and *metoecus* workers from the mixed colony began to penetrate the nest of the Amissville colony and remove brood. The invaders were actively resisted by the Amissville workers, and only after the latter had been over-

whelmed by numbers and mostly destroyed was all of the raided brood removed. The raided brood, consisting solely of large larvae and worker pupae, was completely eaten by the mixed colony within twenty-four hours after it had been transported to the mixed-colony nest. A control experiment was then conducted in which two colonies of *minimum* collected at Falmouth, Massachusetts, were placed together in a common foraging arena under conditions as similar as possible to those of the original experiment. At the time of writing these two colonies have been living together for a period of three months without a raid developing in either direction.

Despite the different outcomes of the original and control experiments, it is our opinion that *metoecus* is not a dulotic ant. There are several good reasons for arriving at this tentative conclusion. (1) The laboratory raid resulted in intense combat with complete destruction of the raided colony, and the captured brood was quickly eaten instead of being reared, conditions that suggest simple predation rather than dulosis. (2) Functional host queens were present in the mixed colony, not a normal condition associated with dulosis. (3) The *metoecus* workers show none of the modifications, either morphological or ethological, commonly associated with dulosis.

But whether the parasitism is dulotic in nature or not, it is clearly at a very primitive level. In fact, it is questionable whether on the basis of the present evidence the relationship can be properly called parasitism at all. There is at present no sure indication that the *metoecus* workers are ethologically degenerate in any way, i.e., that they do not perform their "fair share" of the work load. The relationship is reminiscent of non-parasitic parabiosis, except that in the known cases of parabiosis the participating colonies remain segregated in separate chambers within the nest and never mix their brood. It is perhaps much closer to the strange kind of symbiosis recently discovered as existing between the New Guinea dacetine ants *Strumigenys loriae* and *Kyidris yaleogyna* (Wilson and Brown, 1956). The two species live in completely mixed colonies, with *Kyidris* queens and workers forming a slight numerical minority of the adult population.

The *Kyidris* workers still perform normal tasks inside and outside the nest, but their behavior tends to be degenerate and ineffectual, and they do not carry a "fair share" of the work. For example, they hunt for insect prey along with the *Strumigenys* workers, but with very low efficiency, and they do not join in nest construction at all. Other cases of very primitive parasitism, or at least pre-parasitic symbiosis, may occur among species of the Nearctic *Formica obscuriventris* group, as described by King (1949, 1955) and King and Sallee (1951). Apparently various pairs of species of this group commonly form mixed colonies by the method of indiscriminate mutual adoption of newly-fertilized queens of one species by the established colony of another. Such mixed nests have been studied in Iowa by King and Sallee, and there is good evidence that they occur elsewhere (Brown, unpublished notes).

The cases of *Monomorium metoecus* and *Kyidris yalcogyna* suggest the possible first steps in one evolutionary pathway of permanent social parasitism. It is conceivable that parasitism of this sort starts when one species simply becomes resident with another, degenerating to the extent that it can no longer exist independently, but at first maintaining a normal, fully functional worker caste. Evolution proceeds as the worker caste ceases to function normally and is reduced in numbers, finally to be eliminated altogether.

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Gall Flies (Itonididae) and Parasitic Hymenoptera Reared from Rosette Galls of Willow

By W. W. Judd, Department of Zoology, University of Western Ontario, London, Ontario

On February 14, 1956, a collection of 200 "rosette" galls was taken from shrubs of sand-bar willow, *Salix interior* Rowlee, in an abandoned brickyard at the northwest corner of Taylor and Cheapside Streets at London, Ontario. Each gall was put in a separate, numbered, glass vial of dimensions 60 mm. × 15 mm., plugged with cotton. The vials were kept on a rack at room temperature in a laboratory and were examined daily for the presence of insects which had emerged from the galls. The insects were pinned or preserved in fluid and labelled to show the date of their emergence and the number of the gall from which each insect emerged. After December 31 all the galls were dissected and their contents were noted and insects remaining in them were removed and preserved. The flies and wasps, respectively, were identified by Dr. J. R. Vockeroth and Dr. O. Peck, Entomology Division, Department of Agriculture, Ottawa. All the insects are deposited in the collection of the Department of Zoology, University of Western Ontario, except some specimens retained in the Canadian National Collection (CNC), as noted in the following account. Of the 200 galls 9 yielded adult flies (*Rhabdophaga* sp.), 69 yielded parasitic wasps, 16 contained dead itonidid larvae, 51 contained dead itonidid pupae and 55 were without contents. The numbers of adult insects reared and dissected from the galls are shown in table 1.

Diptera

Itonididae

Rhabdophaga (*rhodoides* Walsh?)

Five flies emerged from five galls between March 14 and April 3, including one male (March 14) and four females; and four females were found dead in four other galls when they

were dissected. Five specimens are deposited in the CNC. Felt (1940) records that *R. rhodoides* causes an open rosette gall on willow.

HYMENOPTERA

Torymidae

Torymus sp. (near *longistigma* (Huber))

Five wasps emerged from five galls between May 14 and June 11 and twelve more were found in twelve dissected galls. Six wasps are deposited in the CNC. Wasps of the genus *Torymus* were reared by Judd (1953, 1955, 1957) from other kinds of galls on willow in the vicinity of London.

Pteromalidae

Amblymerus (*salicis* (Grt.)?)

Two wasps emerged from two galls on March 10 and April 7 and both are deposited in the CNC. In addition, when the galls were dissected, two wasps of the tribe Pteromalini were found dead in two galls (table 1). Wasps of the genus *Amblymerus* were reared by Judd (1957) from the beaked willow gall at London and Muesebeck *et al.* (1951) record that *A. salicis* is a parasite of an itonidid gall on willow.

Tridymus sp.

One wasp emerged from a gall on April 24 and thirty-four were found dead in thirty-four galls, with a single wasp in the core of each gall, when the galls were dissected. Fourteen of the wasps are deposited in the CNC. Judd (1953) records *Tridymus* sp. as a parasite of *Rhabdophaga strobiloides* at London.

Eulophidae

Tetrastichus sp. (near *nebraskensis* (Grlt.))

Four wasps emerged on March 8 through minute holes, one-quarter mm. in diameter, in the base of the gall which later

yielded from its core a specimen of *Amblymerus* (*salicis*?) on April 7. The four wasps are deposited in the CNC. Wasps of the genus *Tetrastichus* were reared by Judd (1953, 1955) from other willow galls at London.

TABLE 1. Numbers of Insects Collected from Rosette Galls of Willow

Date 1957	*Rhabdophaga* (*rhodoides*?)	*Torymus* sp. (nr. *longistigma*)	*Amblymerus* (*salicis*?)	Pteromalini	*Tridymus* sp.	*Tetrastichus* sp. (nr. *nebraskensis*)	*Platygaster* sp. (nr. *affinis*)	*Platygaster* sp. (nr. *obscuripennis*)	*Atritomellus* sp.
March 8						4			
March 10			1						
March 14	1								
March 15	1								
March 26									1
March 28	1								
April 3	2								
April 7			1						
April 24					1				
May 14		1							
May 28		1							
May 30		1							
June 4		1							
June 11		1							
From dissected galls	4	12		2	34		40	8	
Total	9	17	2	2	35	4	40	8	1

Platygasteridae

Platygaster sp. (near *affinis* Fouts)

Forty wasps were found in four galls when they were dissected, with 8, 10, 11 and 11 wasps, respectively, crowded in the core of each gall. Four wasps are deposited in the CNC. Judd (1955) records rearing *Platygaster* sp. from willow galls caused by *Phytophaga tumidosae* at London.

Platygaster sp. (near *obscuripennis* Ashm.)

One wasp was found dead in the core of each of eight galls dissected. Three are deposited in the CNC.

Ceraphronidae

Atritomellus sp.

One male wasp emerged from a gall on March 26 and is deposited in the CNC. Muesebeck *et al.* (1951) list no known hosts of the species of *Atritomellus* reported by them and record that the host relations of few species in the family Ceraphronidae are known.

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On the Genus Arhysosage Brèthes from Argentina [1] (Hymen., Apoidea, Panurginae)

By J. S. Moure, C.M.F.,[2] Department of Entomology, University of Kansas, Lawrence, Kansas and Secção de Zoologia, Universidade de Paraná, Curitiba, Brasil

This genus of Brèthes remained unrecognized until Dr. C. D. Michener and I had an opportunity to examine the types in Buenos Aires, and found that the type species, *Arhysosage johnsoni* Brèthes, is the same as *Camptopoeum ochraceum* Friese. It had not previously been apparent that *Arhysosage* belonged to the Panurginae. Another genus described by the same author which we also found to be a panurgine is *Callonychium*.

The group here called *Arhysosage* was well recognized and characterized by Timberlake who erected the genus *Ruiziella* (= *Ruizapis*) for it. His placement of it in Calliopsini was not fortunate, however. As far as known the genus is restricted to Argentina.

ARHYSOSAGE Brèthes

Camptopoeum of Friese, Ducke, Schrottky, Cockerell, and Joergenson (in part).

Arhysosage Brèthes, 1922, An. Soc. Ci. Argentina, 91: 121; Sandhouse, 1943, Proc. U. S. Nat. Mus., 92: 528.

Ruiziella Timberlake, 1952, Ann. Ent. Soc. Amer., 45: 105 (not *Ruiziella* Cortés, 1951).

Ruziapis Timberlake, 1952, Ann. Ent. Soc. Amer., 45: 528 (new name for *Ruiziella* Timberlake).

[1] Contribution no. 982 from the Department of Entomology, University of Kansas.

[2] I wish to thank the Rockefeller Foundation (New York), the National Science Foundation (Washington) and the Campanha de Aperfeiçoamento de Pessal de Nível Superior (Rio de Janeiro) for aid that made this study possible. Also, I wish to thank Dr. Carlos Alberto Campos Seabra of Rio de Janeiro for the stimulus and generosity which he is giving to studies of Brasilian bees, and Dr. Charles D. Michener of the University of Kansas for help in preparation of this paper.

Ruizapis Timberlake, 1953, Ann. Ent. Soc. Amer., 46: 598 (correction of spelling of *Ruziapis*).

Type species: *Camptopoeum ochraceum* Friese, 1908 (= *Arhysosage johnsoni* Brèthes, 1922).

Arhysosage ochracea (Friese)

Camptopoeum ochraceum Friese, 1908, Flora og Fauna, 10: 29; Jensen-Haarup, 1908, Flora og Fauna, 10: 101; Joergensen, 1909, Deutsche Ent. Zeitschr., 1908: 58; Strand, 1909, Deutsche Ent. Zeitschr., 1909: 230; Cockerell, 1909, Proc. U. S. Nat. Mus., 38: 416; (?) Strand, 1910, Zool. Jahrb., Abt. f. Syst., 29: 458; Joergensen, 1912, Zool. Jahrb., Abt. f. Syst., 32: 118; Joergensen, 1912, An. Mus. Nac. Buenos Aires, 22: 307; Schrottky, 1913, An. Soc. Ci. Argentina, 75: 244.

Psaenythia bifasciata Friese, 1908, Flora og Fauna, 10: 41; Jensen-Haarup, 1908, Flora og Fauna, 10: 101; Joergensen, 1909, Deutsche Ent. Zeitschr., 1909: 59; Holmberg, 1921, An. Mus. Nac. Buenos Aires, 31: 296, 307.

Camptopoeum bifasciatum, Joergensen, 1912, Zool. Jahrb., Abt. f. Syst., 32: 118; Joergensen, 1912, An. Mus. Nac. Buenos Aires, 22: 307; Schrottky, 1913, An. Soc. Ci. Argetina, 75: 244.

Camptopoeum opuntiarum Joergensen, 1912, Zool. Jahrb., Abt. f. Syst., 32: 118; Joergensen, 1912, An. Mus. Nac. Buenos Aires, 22: 307.

Arhysosage johnsoni Brèthes, 1922, An. Soc. Ci. Argentina, 93: 122.

Camptopoeum castellani Cockerell, 1940, Amer. Mus. Novitates, 1080: 1.

Ruiziella ochracea, Timberlake, 1952, Ann. Ent. Soc. Amer., 45: 105.

Ruiziella bifasciata, Timberlake, 1952, Ann. Ent. Soc. Amer., 45: 105.

Ruiziella castellani, Timberlake, 1952, Ann. Ent. Soc. Amer., 45: 105.

The color variation in females of this species is very striking. In the large series of specimens in the Snow Entomological Museum, University of Kansas, is a black specimen, with only the following parts yellow: narrow lines along the inner and outer orbits, mandibular bases, an interantennal stria separate from preocellar spot, a very narrow band on the posterior mar-

gin of the scutellum and metanotum, and a broad band on the fifth tergum. There are specimens with a band also on the fourth tergum (*bifasciata*) and with interrupted bands on the first two terga. In other females the general background color of the abdomen passes to brown and in a specimen from Paso de los Funes, San Luiz, Argentina, the background is reddish, the bands reduced to small lateral spots, even on the fourth tergite, and interrupted on the fifth (*castellani*) (I saw the type of *castellani* in the United States National Museum).

The males seem quite uniform, although that described as the male of *castellani* by Cockerell makes one think of the possibility that males, too, are polychromatic.

The two species described below are exceedingly similar to *ochracea* and to one another but do not exhibit the polychromatism of *ochracea*.

Arhysosage flava new species

?*Camptopoeum ochraceum* Strand, 1909, Deutsche Ent. Zeitschr., 1909: 290; Strand, 1910, Zool. Jahrb., Abt. f. Syst., 29: 458.

Male: Coloration entirely yellow, even abdomen without bands; mandibles (apices fuscous), subantennal areas and adjacent parts of clypeus white; under surface and legs very pale yellow; dark markings reduced to fine dark brown lines along notalices, scuto-scutellar suture, margins of metanotum next to tegulae, and the facial foveae. Wings hyaline; tegulae, veins, and pterostigma yellow.

Pilosity all pallid, very short, even on dorsum of mesonotum, a little longer on head and sides of thorax.

Punctuation fine and rather dense, especially on clypeus which is dull.

Width of head over twice distance from anterior margin of clypeus to lower margin of median ocellus (184:82); length of eye little over half of upper interorbital distance, this less than lower interorbital distance (75:120:165); interocellar distance slightly less than ocellocular (27:28); interantennal distance equal to length of scape and four times length of subantennal area (40:40:9), the latter distinctly broader than long (15:9);

labrum almost twice as broad as long (70:40), entirely flat, without labral plate ("basal area of labrum").

Length 10 mm.; length of wing (including tegula) 6.5 mm.; head width 3.1 mm.; abdominal width 3.5 mm.

The structure that distinguishes this species most easily from the others is the form of the clypeus of the male, which is considerably broader laterally in this species. Also, the labrum is relatively broader and shorter (70:30), in contrast to *A. ochracea* (65:40).

Female: Entirely yellow, without abdominal bands, sutures mostly finely brown on head and thorax; clypeus whitish with two small brown points; brown lines of facial foveae generally united by an equally fine brown line behind ocelli; ventral side of thorax dark brown as are coxae and trochanters, latter with yellow spots; sternites two to five with some brown spots.

Width of head more than twice distance from anterior margin of clypeus to lower margin of median ocellus (152:83); eye length a little less than upper interorbital distance which is less than lower interorbital (80:92:120); interocellar distance slightly less than ocellocular (27:29); interantennal distance equal to length of scape and 3.4 times length of subantennal area (34:34:10), the latter broader than long (13:10); labrum without labral plate, a little elevated transversely near base, twice as broad as long (60:32); clypeus approximately five times as broad as long (148:30).

Length 9.2 mm.; length of wing (including tegula) 6.0 mm.; head width 2.5 mm.; abdominal width 3.0 mm.

Distribution: Ing. Juarez, Formosa, ARGENTINA (type locality), December, 1950 (F. H. Walz); Gran Guardia, Formosa, Argentina (J. Foerster); Santiago del Estero, Argentina (Gomez); Recreo, Catamarca, December, 1951 (F. H. Walz).

Types: Holotype male and allotype female, in the Snow Entomological Museum, University of Kansas. Twenty-six paratypes in that collection, and collections of Dr. Carlos Alberto Campos Seabra (Rio de Janeiro), the United States National Museum, the American Museum of Natural History, the British Museum (Natural History), the Museo Argentina de Ciencias

Naturales "Bernardino Rivadavia" (Buenos Aires), the Departamento de Zoologia, Secretaria de Agricultura do Estado de São Paulo (São Paulo), and the author's collection.

Arhysosage germana new species

This species is very similar to the two preceding, resembling more *A. ochracea* by the abdominal bands, but considerably smaller and never reaching the strong melanization common in that species. In the clypeal form of the male this species also resembles *ochracea*. I think it is not merely a case of allometry, since there is available a large number of specimens, quite uniform. The three species occur sympatrically in the region of Catamarca.

Male: Head and thorax yellow, abdomen of a light ferruginous brown with yellow bands on bases of tergites; apices of mandibles dark and sutures of head and thorax light brown; facial foveae black. Wings hyaline, veins and pterostigma yellow, vein R rather dark.

Pilosity white, a little more developed than in the preceding species.

Punctuation a little denser than in *ochracea,* resembling that of *flava*. (This character most evident in clypeal region which in *ochracea* is more shining.)

Head considerably broader than distance from clypeal margin to lower margin of median ocellus (144:80); eye shorter than upper interorbital distance, about half lower interorbital distance (64:86:126); interocellar distance longer than ocellocular (26:23); interantennal distance a little shorter than scape, three times length of subantennal area (30:32:10), the latter slightly broader than long (11:10); labrum without elevated labral plate, almost twice as broad as long (50:27); clypeus about four times as broad as long (120:29), quite narrow laterally, in this feature resembling *ochracea;* subapical inner mandibular tooth very weak, only vestigial.

Length 7.5 mm.; length of wing (including tegula) 5.9 mm.; head width 2.5 mm.; abdominal width 2.7 mm.

Female: Color as in male, markings very weak on ventral part of thorax, less defined than in *flava,* black lines of facial foveae generally united behind the ocelli; face generally with pale brown area in the form of inverted U with its base on ocelli and arms directed toward antennal sockets; mesonotum with three more or less pronounced brown lines, one median and extending to anterior border, the others on each side shortened in front, all uniting at scuto-scutellar suture; propodeum usually with brown T-shaped spot, cross bar of which is curved along base next to metanotum.

Head distinctly broader than distance from clypeal margin to lower margin of median ocellus (140:86); eye length equal to upper interorbital distance but less than lower interorbital distance (80:81:102); interocellar distance slightly more than ocellocular (21:20); interantennal distance distinctly longer than length of scape and more than 2.5 times length of subantennal area (27:33:10), latter practically as long as broad (10:10); labrum without labral plate almost twice as broad as long (50:27); clypeus little over three times as broad as long (100:31), distinctly narrowed toward sides.

Length 7.2 mm.; length of wing (including tegula) 5.5 mm.; head width 2.3 mm.; abdominal width 2.8 mm.

Distribution: Recreo, Catamarca, ARGENTINA (type locality), December, 1951 (F. H. Walz); Rio del Valle, 580 meters altitude, Catamarca, Argentina, November 5, 1951; Catamarca, November, 1951 (J. Foerster); Catamarca, December 8, 1951 (A. Martinez); Catamarca (without other data, from Museo Argentino de Ciencias Naturales "Bernardino Rivadavia").

Types: Holotype male and allotype female in the Snow Entomological Museum, University of Kansas. Eighty-two paratypes in that collection and in collections of Dr. Carlos Alberto Campos Seabra (Rio de Janeiro), the United States National Museum, the American Museum of Natural History, the British Museum (Natural History), the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (Buenos Aires), and the Departemento de Zoologia, Secretaria de Agricultura do Estado de São Paulo (São Paulo), the Museu Nacional (Rio de Janeiro), and the author's collection.

Nomenclatural Changes in Trachymyrmex (Hym.: Formicidae, Attini)

By Neal A. Weber, Swarthmore College, Swarthmore, Pennsylvania

Trachymyrmex, one of the largest genera of fungus-growing ants, has been difficult to characterize because of its similarity to some *Acromyrmex* and *Sericomyrmex* and because of the diversity of its species. From *Acromyrmex* it differs principally in its feeble or no polymorphism and generally greater spinosity and pilosity; *Sericomyrmex* has a cordate head with rounded occipital lobes and long, abundant, silky hairs. The species of *Trachymyrmex* vary in size from 2 mm. to about 5 mm. and normal infraspecific variability was seldom realized when descriptions were first published. Examinations of the three chief European collections of fungus-growing ants [1, 2] and field work and laboratory studies of living colonies have made possible the following nomenclatural changes in the genus.

Trachymyrmex cornetzi Forel

1912. *Atta* (*Trachymyrmex*) *cornetzi* Forel, Mem. Soc. Ent. Belg. 19: 183.
1912. *Trachymyrmex cornetzi* var. *naranjo* Forel, Mem. Soc. Ent. Belg. 19: 184. New Synonymy.
1922. *Trachymyrmex cornetzi* var. *bivittatus* Wheeler, Am. Mus. Novitates, No. 45, p. 13. New Synonymy.
1931. *Trachymyrmex uncifer* Santschi, Rev. de Ent. 1: 281. New Synonymy.
1936. *Trachymyrmex annulatus* Santschi, Rev. de Ent. 6: 201. New Synonymy.
1940. *Trachymyrmex cornetzi* ssp. *gatun* Weber, Rev. de Ent. 11: 420. New Synonymy.
1945. *Trachymyrmex cornetzi* ssp. *brevispinosa* Weber, Rev. de Ent. 16: 55. New Synonymy.

[1] Supported by a grant from the National Science Foundation.

[2] Those of Forel in the Muséum d'Histoire Naturelle in Geneva, Switzerland, in charge of Dr. Ch. Ferrière; of Santschi in the Naturhistorisches Museum, Basel, Switzerland, in charge of Dr. Fred Keiser; and of Emery in the Museo Civico Di Storia Naturale, Genoa, Italy, in charge of Dr. Delfa Guiglia. Types in the U. S. National Museum have also recently been examined.

Three pins in the Forel collection are marked "Typus," one with three workers being labelled: "Tr. Cornetzi ☿ type, Forel, Sta. Martha, Colombie (Forel)." The thorax length of these including neck is 1.27–1.30 mm. A pin of three worker cotypes from the reserve collection given to me in an exchange with Dr. Ferrière has thorax lengths of 1.25–1.38 mm. The one type of the var. *naranjo* is somewhat spinier in places but is considered to be the same form.

The *annulatus* type in the Santschi collection is labelled: "Panama, San Francisco, Bierig, 8.vi.30." It has the usual brown frons spot of *cornetzi* but so concealed by the general dark color as to be difficult to see. The thorax length, excluding the neck, is 1.14 mm. or 1.2 mm. with neck. The *uncifer* type (labelled: "France Fld") in this collection is dirty and also very dark but faintly showing the same spot on the frons; the total extended length as mounted is 3.67 mm. including porrect mandibles and the thorax length with neck is 1.33 mm.

British Guiana and Surinam specimens (Weber, 1946, Rev. de Ent. 17: 145) belong to the typical form as do the Trinidad representatives described as the var. *bivittatus,* the Barro Colorado Island, Canal Zone ants described as *gatun* (although with a feeble post-occipital tubercle lacking in the six above Forel cotypes), and the Rio Porce (Lat. 6°40′ N., Long. 75°10′ W), Colombia ants called *brevispinosa* which are dark brown.

This species is much more common and variable in spinosity and color than formerly realized. The color is frequently pale ferruginous.

Trachymyrmex cucumis (Mann) comb. nov.

1922. *Myrmicocrypta cucumis* Mann, Proc. U. S. Nat. Mus. 61: 45.

Two worker cotypes in the U. S. National Museum-Mann collection are typical small *Trachymyrmex* with the large postpetiole characteristic of the smallest species of the genus. This, from above, is as broad as long although being narrowed anteriorly it looks longer than broad. Compared with the holotype of *schomburgki,* the habitus is similar. The thorax length is

the same (0.9 mm.) and has similar spinosity except that the lateral pronotal spines of the latter are longer. When more specimens of both species are available *schomburgki* may be considered to be the same or a subspecies. The holotype of *carib* is bigger and coarser and *tucuché* is more sharply rugulose on the frons, the anterior lateral pronotal tubercles are coarser and the postpetiole is distinctly broader than long.

Trachymyrmex farinosus Emery

1894. *Atta* (*Trachymyrmex*) *farinosus* Emery, Bull. Soc. Ent. Ital. 26: 221.
1938. *Trachymyrmex trifurcatus* Weber, Rev. de Ent. 9: 199. New Synonymy.

The Emery collection has a single pin labelled: "124. Para; n. sp. Para, Schutz; *Atta farinosa* Em." which has doubtless the type. The thorax, including a short neck, is 1.77 mm. long. It agreed very well with a paratype of *trifurcatus* (King Frederick William IV Falls, Courantyne R., Surinam, 16.vii.36, N. A. Weber 577) and, despite minor differences, is conspecific. These two ants and the holotype of *trifurcatus* have a peculiar and massive lateral gastric swelling on each side that absorbs the usual gastric carina posteriorly. The *farinosa* hairs are fine and simple; some of the *trifurcatus* hairs are narrow-squamose but this is believed to be a variable character.

Trachymyrmex opulenta (Mann) comb. nov.

1922. *Sericomyrmex opulenta* Mann, Proc. U. S. Nat. Mus. 61: 48.

Six worker cotypes in the U. S. National Museum-Mann collection are typical *Trachymyrmex* with the same habitus as *wheeleri*, which was also described as a *Sericomyrmex* because of the unusually long and abundant silky pilosity. The well developed occipital tubercles, however, and the head in general are not those of *Sericomyrmex* as now considered (and as characterized by Mayr originally). The *opulenta* cotypes have shorter occipital tubercles and higher basal carinae on the epinotum anteriorly than *wheeleri* cotypes.

Trachymyrmex saussurei Forel

1884. *Atta tardigrada* st. *saussurei* Forel, Bull. Soc. Vaud. Sc. Nat. 20: 361.

The Forel collection now was found to have only *Sericomyrmex saussurei* Emery (and under *Sericomyrmex*), an entirely different ant, but the Santschi collection has one specimen under *Trachymyrmex* labelled: "A. acrom. Saussurei For. (Pergande); Samlung Dr. F. Santschi Kairouan." It is in the space labelled *Trachymyrmex saussurei* Forel.

The extended length of the ant (a worker) is 4.30 mm., the thorax 1.90 mm. It is bigger and coarser than *septentrionalis* but with the same general arrangement of spines and head contours. The postpetiolar node from above is 0.4 mm. long × 0.46 mm. wide. A pin of three workers from the duplicate Forel collection given to me by Dr. Ferrière in exchange appears to be type material. It bears the labels: "41; Mexiq. Orizaba; A. Saussurei, ☿ Forel; cn de Saussure." A pin of one worker given to me by W. M. Wheeler in the 1930's bears the label "Tepic, Mexico" and the label written by his secretary at the time "Cyphomyrmex (Trachymyrmex) saussurei Forel." The three workers may be type material. In the Biologia Centrali-Americana Tepic and Orizaba are the localities listed for the species.

This species may be close to the parental stock from which the far-ranging *septentrionalis* was derived and the ants may have spread along the northern Gulf of Mexico coast to and along the Atlantic coast. The resemblance between the two species is so close that one could still be considered a subspecies of the other. Since *septentrionalis* was described earlier, this would be the species name although perhaps inappropriate from the point of view of origin.

Trachymyrmex septentrionalis McCook

1880. *Atta septentrionalis* McCook, Proc. Acad. Nat. Sc. Philadelphia, pp. 359–363.

1907. *Atta* (*Trachymyrmex*) *septentrionalis* var. *obscurior* Wheeler, Bull. Amer. Mus. Nat. Hist., 23: 709. New Synonymy.

1911. *A.* (*T.*) *septentrionalis* var. *vertebrata* Wheeler, Jour. N. Y. Ent. Soc. 19: 246.
1911. *A.* (*T.*) *septentrionalis obscurior* var. *irrorata* Wheeler, Jour. N. Y. Ent. Soc. 19: 247.
1911. *A.* (*T.*) *septentrionalis obscurior* var. *crystallina* Wheeler, Jour. N. Y. Ent. Soc. 19: 247.
1911. *A.* (*T.*) *septentrionalis obscurior* var. *seminole* Wheeler, Jour. N. Y. Ent. Soc. 19: 247. New Synonymy.
1950. *Trachymyrmex septentrionalis* Creighton, Bull. Mus. Comp. Zool. 104: 323.

In his original description, McCook called attention to the variability of the worker caste from 3 to 4 mm., referring to them as "workers major and minor." As Creighton has shown (and as Wheeler intimated for *irrorata* and *crystallina*), *vertebrata, irrorata* and *crystallina* are variants of no taxonomic significance and the present author believes that *obscurior* and *seminole* have the same value. Numerous colonies of New Jersey and Florida origins kept in the laboratory have shown the variation in size that McCook was the first to realize. Color varies greatly and appears of no consequence in this species. Biological studies of these two populations (Weber, 1956, Ecology 37: 150–161, 197–199) have proven their fundamental similarity.

The geographical range of this species, while considerable, is not unusual for a fungus-grower and the ecology appears quite uniform, with temperature the chief variant.

Trachymyrmex urichi Forel

1893. *Atta* (*Trachymyrmex*) *urichi* Forel, Ann. Soc. Ent. Belg. 37: 601.
1894. *Atta* (*Trachymyrmex*) *urichi* subsp. *fusca* Emery, Bull. Soc. Ent. Ital. 26: 222. New Synonymy.
1912. *Atta* (*Trachymyrmex*) *urichi* subsp. *marthae* Forel, Mem. Soc. Ent. Belg. 19: 183. New Synonymy.
1925. *Trachymyrmex urichi* subsp. *panamensis* Wheeler, Arkiv. För Zool. 17: 38. New Synonymy.
1938. *Trachymyrmex urichi* ssp. *radicis* Weber, Rev. de Ent. 9: 197. New Synonymy.

The Emery collection contains the two types of *fusca* mounted on one pin and carrying on the upper label: Coxipò; lx.900

(Matto Grosso). The upper ant has a thorax length of 1.77 mm., the lower ant 1.57 mm. They are no darker than some Panama and Colombian specimens and in other characters appear to be within the normal range of infraspecific variability.

The Forel collection contains a large series of the types of *marthae* and a pin of three workers was secured by exchange with Dr. Ferrière. It bears the label: Tr. Urichi Forel; ☿ r. Marthae Forel; Sta. Martha, Colombie (Forel). They are a dark brown but otherwise like *urichi,* which has been collected numerous times by the author in the type locality, Trinidad (see Rev. de Ent. 1945, 16: 44–54). The subspecies *panamensis* was based largely on color and these ants have since been found to be common on the Pacific slopes of Panama. While often of the color described by Wheeler, specimens from the same localities, but taken in March, 1957, during the height of an unusually severe dry season, were as dark as those named *marthae* by Forel. The subspecies *radicis* was based on small specimens, probably of a young colony. The species also occurs in Venezuela. Throughout its range it is an ant of the savannah or grass-woodland rather than of closed forests.

Trachymyrmex wheeleri (Weber) comb. nov.

1937. *Sericomyrmex wheeleri* Weber, Rev. de Ent. 7: 396.
1937. *Sericomyrmex wheeleri* subsp. *pakeelai* Weber, Rev. de Ent. 7: 398. New Synonymy.

In pilosity and high mesonotal spines these ants resemble *Seriomyrmex*. However, the head is typical *Trachymyrmex*. They have the same habitus as *opulenta* but six cotypes in the U. S. National Museum have distinctly shorter occipital spines and higher basal carinae on the epinotum anteriorly. The type series of *pakeelai* consistently show lower and more rounded occipital spines, lower mesonotal spines and much more marked tubercles on the declivous surface of the mesonotum. These are believed now to fall within the normal infraspecific range of variability. Additional collecting and study may show *wheeleri* to be no more than a subspecies of *opulenta*.

Specimens taken by the author at Rio Porce (Lat. 6°40′ N., Long. 75°10′ W.), Colombia in 1938 are of this species. Males and females came to lights about 3–4 A.M., August 1 and a nest containing males was excavated July 21. The workers are dark brown. This species does not appear to have been taken in Colombia by Forel and is not his *gaigei*.

Trachymyrmex zeteki Weber

1940. *Trachymyrmex zeteki* Weber, Rev. Ent. 11 : 422.
1940. *Trachymyrmex balboai* Weber, Rev. Ent. 11 : 424. New Synonymy.

Additional collecting and study since 1938 in the type locality, Barro Colorado Island, Canal Zone, show that the differences noted in the two species cannot be sustained and that they are best considered to be the same species, *zeteki* having page priority. A colony kept for over two years in the laboratory shows a variation in worker morphology that was unknown in 1940. A conspicuous feature is the spatulate pilosity but this is of variable extent.

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All comments relating to the following should be marked with the Commissioner's File Number and sent to Francis Hemming, 28 Park Village East, Regent's Park, London N.W.1, England.

Calandra (Calendra) Clairville and Schellenberg, 1798, suppression of, in favor of *Sphenophorus* and *Sitophilus,* both of Schoenherr, 1838, respectively, in interests of universality of nomenclature; *abbreviatus* Fabricius, 1787 (*Curculio*) and *oryzae,* emendation to, of *oryzae* Linnaeus, 1783 (*Curculio*), validation of (Class Insecta, Order Coleoptera). File: Z.N.(S.)255. For details, see Bull. Zool. Nomencl., Volume 16, Part 1.

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